and is the most accurate method available in the differential diagnosis between pregnancy and pelvic tumor, multiple pregnancies, monstrosities, and gross pelvic deformities.

The use of roentgen rays in the early diagnosis of pregnancy (before the sixteenth week) cannot be accurately made with sufficient frequency to warrant its recommendation except in very selected cases, as there are too many conditioning factors which cannot be controlled.

T. HENSHAW KELLY, M. D. (490 Post Street, San Francisco).—There is very little to add to Doctor Garland's presentation of the roentgenographic diagnosis of pregnancy. He has stressed the important fact that diagnostic x-ray procedures during pregnancy are harmless both for mother and fetus.

In practice I believe the value of roentgenographic examination lies not so much in the early diagnosis of pregnancy—which is better done by the Zondek-Aschheim test—but in the differentiation of pregnancy and tumor masses and in the determination of the presence of twins, monstrosities, and malformations of the pelvis.

Unquestionably the reasoned use of roentgenographic diagnostic procedures adds definitely to the means available for determining the existence of pregnancy, its questioned duration, and certain conditions obtaining in the fetus.

TULAREMIA IN CATTLE AND SHEEP*

By J. C. GEIGER, M. D.
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DISCUSSION *by K. F. Meyer, Ph. D., San Francisco; W. T. Cummins, M. D., San Francisco.*

TULAREMIA is an infectious disease. It is caused by the *Bacterium tularense*. It is primarily in nature a disease of wild rabbits, yet its zoölogical habitat or distribution may be in many other animals. Man receives the infection secondarily, the mode of transmission being from rodents to man through the bite of an infected blood-sucking fly or tick or by contamination of open wounds or skin abrasions usually on the hands or conjunctiva, generally with the liver or spleen or other portions of the infected rodents or other susceptible animals, and from certain flies and ticks and perhaps other blood-sucking insects as the mosquito. In fact, the latter possibility was suggested by Geiger and Meyer[1] in their epidemiological investigation of tularemia in Nevada. Moreover, these authors indicated such bizarre methods of transmission as dogs licking open wounds, coyote pup bites (both dogs and coyotes having been known to have been chasing rabbits), the wiping of hay knives on machines after cutting through or into rabbits nesting in the hay, barbed-wire cuts, the handling of dead animals such as turkeys. Francis mentioned a case that followed the bite of a ground squirrel in Montana, and one from the bite of a hog in Iowa. Direct contact cases from man to man are exceedingly rare if they occur at all. The disease has many synonyms among which are plague-like disease of rodents, deerfly fever, rabbit fever, and the glandular type of tick fever.

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GEOGRAPHICAL DISTRIBUTION

The geographical distribution of the disease must be extraordinarly wide. Cases have been reported from nearly every state except the New England States, and all the Pacific Coast states except Washington. Geiger and Meyer[1] reported two hundred and ninety-three cases from Nevada alone, and stated that the disease has probably been endemic and unrecognized in Nevada since 1912 though the first case was only reported in 1926. According to the *Bulletin of the California State Department of Public Health*,[2] cases of tularemia were not recognized in California until 1927. The disease was made reportable in June 1928. A total of fifty-four cases have been reported in California of which sixteen occurred in 1928, twenty in 1929, and twelve to May 1, 1930. However, Francis quoted a case from National City, California, in 1904, and quite a number of the California cases received their infection in Nevada. Ohara's disease described in Japan[3] is tularemia, and the first knowledge of this disease in that country was contained in a book by Hamma in 1837, who spoke of an intoxication by rabbit meat. The toxicosis was originally thought to be due to berries of trees or poisonous barks.

ANIMAL DISTRIBUTION

The animal distribution other than man is likewise remarkably wide, but human cases have not resulted from contact with all of these. McCoy[4] gave the first scientific information when he disdiscovered a plague-like disease in California ground squirrels from Tulare County, California. McCoy and Chapin[5] later reported the isolation of the causative organism and named it *Bacterium tularense*. *Bacterium tularense* has been demonstrated in squirrels, wild rats, wild mice, quail, grouse, partridge, pheasants, woodchucks, muskrats, cats, water rats in Russia, wild rabbits in the United States and Japan, coyotes and sheep. Parker and Dade,[6] in reporting on heavy losses among sheep in eastern Montana and southern Idaho, stated that as far as southern Idaho is concerned, the tick-caused pathology in sheep has been due largely, if not entirely, to tularemia. In one herd, affected animals with temperatures of from 106 to 107.8 degrees Fahrenheit were numerous. Many were scouring. There was a high carriage of the head due to regional lymph node involvement, loss of weight, and stiff-legged walk and stupor with persistent cough. Many of the animals died. Furthermore, these authors reported laboratory tests on eight affected animals in this particular herd with the following results: That sera of both acutely ill and recently recovered sheep agglutinated tularemia antigen in high dilution; that tularemia infected tissues and ticks were recovered both from dead and from acutely ill sheep, and that *Bacterium tularense* was recovered in pure culture from sheep tissues and from infesting ticks. The only gross pathology was enlargement or injection of regional glands in the neighborhood where ticks are frequently attached. The evidence presented as to tularemia in sheep is apparently conclusive and the condi-

tion known as tick paralysis, presumably produced by a toxin secreted by the salivary glands of engorged female ticks, as described by Hadwen,[7] is dissimilar but must be differentiated. It is decidedly interesting to note that Parker and Dade mention an observation of Francis's that abortion was noted in an experimentally infected sheep. Parker and Brooks,[8] in commenting upon a pathological condition of two groups of cattle on a ranch near San Benito, California, stated that the symptoms were an apparent typical paralysis. Several of the animals died. One of the groups of cattle was shipped from Madera County, California, and the other from Denver, Colorado. The feeding range was tick-infested, but local cattle on the same range were not affected. Ticks and blood serum were secured from one animal. The ticks on reaching the laboratory were dead, but one each was injected into guinea pigs. Several of the injected animals died with lesions indicating tularemia, and subsequent cultures from the spleen were agglutinated by tularemia-immune human sera. Likewise, the blood serum of the steer agglutinated both *Bacterium tularense* and *Brucella abortus* in dilutions of 1:10, 1:20, and partially in 1:40. Another blood serum agglutinated *Bacterium tularense* 1:40 and partially in 1:80, and *Brucella abortus* in dilutions 1:10 and 1:20. The writers very rightly state that the above data are not sufficient to justify any assumption as to what part *Bacterium tularense* might have played in the pathology of the affected cattle. Perhaps these observations are best described as an indication of the wide dissemination of tularemia in animals and blood-sucking insects. Certainly the agglutination titer is well within the limits to be expected in the cross-agglutination of *Brucella abortus* and *Bacterium tularense* and is of doubtful diagnostic significance. The two human cases from contact with sheep reported by Geiger and Meyer are apparently the first recorded from this source. The intermediary hosts are probably numerous and the known list far from being complete. Deerflies, horseflies, woodticks, rabbit lice, bedbugs, possibly mosquitoes, have been involved. The main sources are flies and ticks. Flies of the blood-sucking species known as *Chrysops discalis* and commonly found on horses and cattle, presumably transmit the infection mechanically. In Utah the disease in man was for years popularly known as deerfly fever. Francis and Mayne[9] proved the *Chrysops discalis* to be a transmitter of the infection.

HEREDITARY TRANSMISSION OF INFECTION BY WOODTICK

The woodtick of the species *Dermacentor andersoni,* already involved in the transmission of Rocky Mountain spotted fever, can transmit not only tularemia infection to man, but as Parker and Spencer[10] have demonstrated, such ticks are perfectly capable of hereditary transmission of infection through their eggs to the next generation. Moreover, these authors' experiments indicate that not all infected females transmit infection to their progeny, that the virulence varies and that the infection may die out. Therefore this insect may be considered along with the wild rabbit as permanent reservoirs of infection. This is probably true as to Nevada. The infection is widely distributed within the insect, namely, the lumen of the gut, the cells of the gut wall, in the circulatory fluid, and the feces. The microscopic changes in ticks as noted by Francis[11] was the distention of the epithelial cells of the rectal sac, intestines and malpighian tubes with organisms. The ideal and usual source of infection, however, is inoculation of self or contamination of wounds or skin through dressing wild rabbits, pulling infected ticks from horses, cows or sheep, or in the laboratory performing autopsies on infected animals.

The disease has a seasonal incidence because ticks and flies are transmitters. Likewise, the so-called rabbit season prevails in many states and in some by law. Therefore, in the spring and summer months, the largest number of cases are reported with the exception of certain sections east of the Mississippi River.

BACTERIUM TULARENSE

Bacterium tularense is a small Gram-negative, nonmotile, nonspore-bearing pleomorphic, aërobic organism. Its best growth occurs on blood glucose cystine agar. It is comparatively easily destroyed by heat. Thus, ordinary cooking renders infected tissue safe for eating. The organism may be isolated from the blood early in the disease. The usual laboratory tests are agglutination tests and animal inoculation. The blood serum of a patient suffering from tularemia agglutinates *Bacterium tularense* in varying dilutions in the second week of the illness and should react to its maximum titer in the fourth week. Persistence of agglutinins has been noted for several years and may be diagnostic. Cross-agglutination may be obtained with *Brucella abortus* strains even to the same titer degree. As a rule tularemia serum agglutinates *Bacterium tularense* in higher dilutions than it agglutinates *Brucella abortus.* Suspected serums should be tested against both organisms unless the clinical history and findings are significant. Such positive tests may be confirmed by animal inoculation. Material from the site of infection or from enlarged suppurating glands should be injected into guinea pigs. Confirmatory animal inoculations of suspected spotted liver or spleens of rabbits should also be done by the so-called pocket inoculation method. The inoculated animals should die in a week, presenting on autopsy gross lesions of caseation of regional lymph nodes, small white focal necrosis in the liver and spleen with enlargement. Cultures may be obtained from the blood or from lesions by the use of cystine agar. Final diagnosis is usually made on the agglutination tests or from the gross pathology evident at autopsy of the disease in experimental animals.

CLINICAL MANIFESTATIONS AND PREVENTIVE MEASURES

The disease is not readily transmitted from man to man, if ever at all. The period of incubation is, as a rule, from two to five days, although it might be as short as one day or as long as nine days. The onset is sudden and is characterized by headache, vomiting, chilliness, chills, pains throughout the body, sweating, prostration, and fever. The disease may present four types: ulcers-glandular, oculoglandular, glandular, and typhoidal. There may be a marked leukocytosis and in many cases a skin eruption can be noted. The mortality rate is interestingly very low. Convalescence, however, is exceedingly slow and relapses have been noted even after eight months.

The preventive measures to be undertaken vary with the problem in the community. Thorough cooking destroys the infection in the meat of the rabbit. The use of rubber gloves is decidedly indicated with dressing rabbits, skinning rabbits, or handling infectious or suspected autopsy or laboratory material. The treatment is only symptomatic and there is not at present a definite specific curative or preventive biological or drug agent.

Hooper Foundation for Medical Research.

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DISCUSSION

K. F. MEYER, Ph. D. (The George Williams Hooper Foundation, University of California, San Francisco). Until 1926 tularemia was a comparatively rare disease and it was thought to be confined to the United States. Of recent years, however, it has assumed greater importance. Not only has it been recognized in Japan, but regular epidemics have occurred in the Union of Soviet Socialist Republics. In 1928 over eight hundred cases were reported from the province of Riazan. It is of interest that the hamster was found to be the carrier of the tularense virus. Since over one million hamster skins are sold annually it is quite evident that hunters are liable to become infected and many cases may have passed unnoticed. In general, tularemia may be considered an occupational disease, the majority of the recorded cases having been found among people skinning infected animals.

The epidemic which broke out on both banks of the Ural in the Orenburg toward the end of August 1928 had the following interesting origin: Early in the spring the R. S. F. S. R. Trade Commissariat distributed a pamphlet urging the inhabitants to collect and sell the skins of water rats (*Arvicola amphibius*). Hunting was made easy on account of floods. Some had "suppurating cysts" which burst when the skin was removed. Over one hundred cases—ninety-three men and twelve women—developed glandular or ulceroglandular type of tularemia. The bacteriological diagnosis was confirmed by Doctor McCoy of the Hygienic Laboratory, who declared the Russian *Bacterium tularense* to be identical with the American. So far nothing definite is known concerning the factors causing the epidemic spread among the rodents. In fact, the peculiar common etiology of plague and tularemia, their transmission by rodents with an insect as an intermediary, raises many questions concerning the common nature of the two infections. Phases of this problem have been emphasized by the data reviewed in the paper of Doctor Geiger.

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W. T. CUMMINS, M. D. (Southern Pacific General Hospital, San Francisco).—The survey and report on tularemia in Nevada by Geiger and Meyer has been a notable addition to the already rather voluminous eastern literature. The presence of the disease in Japan and Russia shows the potentiality of its greater geographical dissemination. To the already large group of about fifteen animals that are susceptible to the disease are added sheep and cattle. It seems probable that the mosquito also may be a vector. In the human being the cutaneous and lymphatic manifestations of tularemia are striking and well-nigh pathognomonic. The oculoglandular and so-called typhoidal manifestations are not so readily interpreted. Serologic examination is our valued support in diagnosis. The guinea pig has contributed its share to the study of another disease. Laboratory infections are peculiarly unfortunate and they have been a deterring factor to more widespread laboratory examinations and study of the disease. The hereditary transmission of the infection in ticks and the chronic disease in the wild rabbit serve to make more difficult the problem of its eradication in the lower animals. The incidence of human infection should be appreciably decreased by the public health propaganda that has detailed the importance of proper protection of the exposed human skin in the handling and skinning of animals.

OTITIS MEDIA—ITS MANAGEMENT AND TREATMENT*

By CLYDE E. HARNER, M. D.
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DISCUSSION *by Robert C. Martin, M. D., San Francisco; Robert S. Irvine, M. D., San Francisco; Orrie E. Ghrist, M. D., Glendale.*

ACUTE and chronic otitis media probably make up the bulk of ear, nose, and throat practice. It is not surprising, therefore, that the management of these cases varies with every doctor and with the myriad agencies used in treating the various conditions met. Varying results to the patient are obtained which, in the main, must necessarily be good, else one's practice would soon dwindle. Yet so much chaff must be separated from the wheat in selection of methods that it does not seem amiss to mention once more the most common and emphasize the most rational and efficacious methods of procedure.

When we think of the vast number of patients who are deaf or hard of hearing, we must admit that this condition is still most important and far-reaching in its effects, and it behooves us to

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